

# Permeation Grouting Used to Strengthen Sand-Based Foundations at Coogee Beach Residence

PROJECT PROFILE

N20GW027

mainmark



## INDUSTRY

Residential

## STRUCTURE

Two-storey house

## PROBLEM

Weak sandy soil

## LOCATION

Coogee, NSW, Australia

## DURATION / YEAR

1 week

## TECHNOLOGY

Permeation Grouting

## BUSINESS UNIT

Mainmark Australia

## Summary

The owners of a two-storey water views property in Coogee, Sydney, had undertaken renovations by adding a new upper level to their home. However, the building works had changed the magnitude of the loads to the footings and load path configuration.

The property's strip footings, which were built on loose sandy soil, needed to be re-supported by strengthening the ground to increase its load bearing capacity. Strengthening the immediate supporting ground under the footings enabled heavier loads to be applied and distributed across a larger area to avoid overloading loose sandy soil.

Coastal areas like Coogee are prone to ground instability due to sandy soil, often leading to significant structural problems during and after the building process. Mainmark worked directly with the homeowner to identify a solution that would satisfy the project's structural engineer, recommending the use of permeation grouting, a long-established and widely used solution, to agglomerate and strengthen the sandy soil.

Prior to commencing the project, the structural engineer required the solution to be trialled on site to confirm it would deliver the level of ground strengthening required to achieve compliance.

Once the trial area had been approved by the structural engineer, Mainmark proceeded to use its permeation grouting solution for the remaining increased load areas around the home.

## Permeation Grouting Used to Strengthen Sand-Based Foundations at Coogee Beach Residence continued

### Objectives

A ground strengthening solution to increase the bearing capacity of loose sandy soil was required. The site's structural engineers also required reassurance that the solution would deliver the necessary load bearing capacity required for the new structure, reducing ground bearing stress at the interface between the treated and untreated founding soils.

### Solution

Permeation grouting was identified by Mainmark as the most appropriate solution to strengthen and consolidate the site's loose sandy soil. Mainmark conducted an initial trial along an area approximately 3 Linear Metres, injecting the permeation grouting solution directly into an area beneath the home's footings measuring 1m wide and 700mm deep.

The process of stabilising non-cohesive soils using permeation grouting involves the application of microfine cement or sodium silicate in liquid form into the ground via permeation spikes (or injection lances) at the depth to be treated, bonded and contained. This technique fills micro voids in the sand to produce a solidified mass, bonding the sand particles with the permeation grout product. The solution is often used to stabilise and strengthen sandy soils prior to excavation and building works.

After completion of the trial at the Coogee home, the structural engineer confirmed the desired level of ground strengthening and load bearing requirements had been achieved. Mainmark then proceeded to complete the project by repeating the same permeation grouting methodology as used during the trial for the remainder of the project.

A total of 14m<sup>3</sup> of permeation grouting formulation was injected across three different zones around the property's perimeter footings including an internal garage footing and the south eastern and south western corners of the home.

The existing structure had very limited side and internal access that would have made alternative piling options extremely difficult.

Mainmark was able to overcome these challenges, delivering a cost effective and efficient solution that resulted in minimal disruption to the dwelling's perimeter and garage slab. The owner continued to inhabit the dwelling during the treatment process.

The project was successfully completed within a week to the homeowner's and structural engineer's satisfaction, with the structural engineer commenting they were also impressed with the way Mainmark executed the work.



Mainmark equipment set up outside the home, with minimal disturbance and occupied space



Holes prepared for injection of permeation grouting